Stability and change of basic personal values in early adolescence: A 2-year longitudinal study

Vecchione, Michele ; Schwartz, Shalom H ; Davidov, Eldad ; Cieciuch, Jan ; Alessandri, Guido ; Marsicano, Gilda

Abstract: Objective: We examined patterns of change and stability in the whole set of ten Schwartz values over two years during early adolescence. Method: Participants completed the Portrait Values Questionnaire repeatedly throughout the junior high school years. The study involved six waves of data and a total of 382 respondents aged 10 years at the first measurement occasion (43% female). We investigated multiple types of stability in the values: mean-level, rank-order, and ipsative (or profile) stability. Results: At the mean-level, self-enhancement and openness to change values increased in importance. Self-direction and hedonism values showed the greatest increase – about one third of a standard deviation. Conservation and self-transcendence values did not change with the exception of tradition, which decreased slightly.. After correcting for measurement error, rank-order stability coefficients ranged from .39 (hedonism) to .77 (power). Correlations between value hierarchies measured two years apart were .85 for 75% of respondents, and .12 for 5% of the respondents. Thus only a small proportion of participants experienced a marked change in the relative importance they ascribed to the ten values. Conclusions: Results are discussed and related to earlier findings on patterns and magnitude of value change during other periods of the life span.

DOI: https://doi.org/10.1111/jopy.12502

Stability and change of basic personal values in early adolescence: A 2-year longitudinal study

Michele Vecchione, Sapienza University of Rome, Italy

Shalom Schwartz, The Hebrew University of Jerusalem, Israel

Eldad Davidov, University of Cologne, Germany, and University of Zurich, Switzerland

Jan Cieciuch, University of Zurich, Switzerland, and Cardinal Stefan Wyszynski University, Poland

Guido Alessandri, Sapienza University of Rome, Italy

Gilda Marsicano, Sapienza University of Rome, Italy

This is the peer reviewed version of the following article: "Stability and change of basic personal values in early adolescence: A 2-year longitudinal study", which has been published in ***Journal of Psychology*** in final form at https://doi.org/10.1111/jopy.12502 on August 11, 2019.

This work has been conducted at Sapienza University of Rome. Correspondence concerning this article should be addressed to Dr. Michele Vecchione, Department of Social and Developmental Psychology, Sapienza University of Rome, Via dei Marsi 78, 00185 Rome, Italy. Email: michele.vecchione@uniroma1.it

Abstract

Objective: We examined patterns of change and stability in the whole set of ten Schwartz values over two years during early adolescence. Method: Participants completed the Portrait Values Questionnaire repeatedly throughout the junior high school years. The study involved six waves of data and a total of 382 respondents aged 10 years at the first measurement occasion (43% female). We investigated multiple types of stability in the values: mean-level, rank-order, and ipsative (or profile) stability. Results: At the mean-level, self-enhancement and openness to change values increased in importance. Self-direction and hedonism values showed the greatest increase – about one third of a standard deviation. Conservation and self-transcendence values did not change with the exception of tradition, which decreased slightly.. After correcting for measurement error, rank-order stability coefficients ranged from .39 (hedonism) to .77 (power). Correlations between value hierarchies measured two years apart were ≥ .85 for 75% of respondents, and ≤ .12 for 5% of the respondents. Thus only a small proportion of participants experienced a marked change in the relative importance they ascribed to the ten values. Conclusions: Results are discussed and related to earlier findings on patterns and magnitude of value change during other periods of the life span.

Keywords: Schwartz's theory of basic human values; value change; stability; early adolescence

Basic personal values are broad beliefs concerning desirable, trans-situational goals that serve as guiding principles in the individual's life (Schwartz, 1992). Values are at the core of individuals' self-concept (Hitlin, 2003). They are enduring beliefs that are relatively consistent over time and across situations (Rokeach, 1973, 1974). Nonetheless, empirical research has revealed significant change in value priorities across the life span and under unusual circumstances (e.g., Ball-Rokeach, Rokeach & Grube, 1984; Bardi, Buchanan, Goodwin, Slabu, & Robinson, 2014; Goodwin, Polek, & Bardi, 2012; Gouveia, Vione, Milfont, & Fischer, 2015; Kluckhohn, 1951; Lönnqvist, Jasinskaja-Lahti & Verkasalo, 2011; Schwartz, 1992, 2006). However, the majority of published studies have investigated samples of adults or late adolescents (e.g., Milfont, Milojev & Sibley, 2016; Myyry, Juujärvi & Pesso, 2013; Robinson, 2013; Schwartz, 2005; Vecchione et al., 2016a).

The current study examines value change among early adolescents. Several studies have demonstrated that a clearly differentiated value structure emerges in middle childhood (Abramson, Daniel, & Knafo-Noam, 2018; Bilsky et al., 2013; Cieciuch, Döring, & Harasimczuk, 2013; Döring, 2010; Döring et al., 2015; Döring, Blauensteiner, Aryus, Drögekamp, & Bilsky, 2010; Knafo & Spinath, 2011; Uzefovsky, Döring & Knafo-Noam, 2016). Little is known, however, about the pattern and magnitude of value change throughout childhood and adolescence. Only recently has research on value change focused on early ages (e.g., Cieciuch, Davidov & Algesheimer, 2016).

The current study contributes to the value literature by investigating stability and change in the values of a large sample of early adolescents. We draw upon Schwartz's theory of human values, a theoretical framework that has received substantial support in multiple studies across cultures (Schwartz, 2006). We adopt the classic version of the theory that distinguishes 10 basic

values that motivate individuals (Schwartz, 1992)[1]: Universalism, benevolence, tradition, conformity, security, power, achievement, hedonism, stimulation, and self-direction. These values form a circular motivational continuum that reflects the pattern of compatibility and conflict among the motivational goals that underlie the values. Values that are close around the circle (e.g., power and achievement) share broad motivational goals and their pursuit leads to compatible consequences. Hence they are positively related. Values that are far apart around the circle (e.g., security and stimulation) express conflicting motivational goals and their pursuit leads to conflicting consequences (Schwartz, 1996, 2006).

According to the theory (Schwartz, 1992), the ten values can be grouped into four broader dimensions. Openness to change values (self-direction, stimulation, hedonism) emphasize receptiveness to change and independence of thought and action. Conservation values (conformity, tradition, security) emphasize preservation of the status quo through maintaining personal and social stability, order, and traditions. Self-transcendence values (universalism, benevolence) emphasize concern for the welfare of others. Self-enhancement values (power and achievement) emphasize promoting one's own personal interests.

The theorized circular structure described in Schwartz's model has important implications for the process of value change. This structure implies that change in value priorities should exhibit a pattern that reflects the conflicts and compatibilities among the ten values. Confirming this implication, several studies have found that increases in the importance ascribed to particular values are accompanied by increases in the importance of other values that share compatible goals and decreases in the importance of other values that express conflicting goals (e.g., Bardi, Lee, Hofmann-Towfigh & Soutar, 2009; Daniel, Fortuna, Thrun, Cioban & Knafo, 2013; Maio,

[1]Schwartz et al. (2012) and Schwartz (2017) present and validate a refined version of the theory that divides the circular motivational continuum into 19 more specific values.

Cheung & Rees, 2009; Vecchione et al., 2016a; Verkasalo, Goodwin & Bezmenova, 2006). For example, increased importance of benevolence values is accompanied by increased importance of universalism values but decreased importance of power values. In this way, concomitant changes among the ten values allows the system to maintain stability. This is analogous to the concept of allostasis in biology, the process through which systems undergoing change achieve stability (Sterling & Eyer 1988). Below, we describe the different types of stability that we investigate and how they relate to the study of values.

Different types of stability and their implications for the study of values

We examine three different types of stability: *mean-level change*, *rank-order stability*, and *ipsative stability*. *Mean-level change* refers to the average change in the importance that a population of interest ascribes to each value. This level of analysis can inform us about typical patterns of change in value importance that occur during specific life stages. Mean-level change in values, as in other personality characteristics, may result from the maturational processes and social influences which most members of a given age group experience. For example, in accordance with the social investment principle (Roberts, Wood & Caspi, 2008), the importance of a values is likely to increase when its expression facilitates accomplishing developmental tasks and adapting to environmental requirements (for a thorough discussion of mechanisms leading to value change, see Bardi and Goodwin, 2011). Accumulated findings on mean-level change across different developmental periods may contribute to understanding how values change normatively across the life span.

Rank-order stability refers to the degree to which the relative ordering of individuals on the importance they ascribe to a given value changes over time. Change in the order of the individuals in a group on a value may be great or small regardless of what happens to the mean-

level importance of that value in the group. High rank-order stability for a value indicates that the individuals in a group who rate the value relatively high in importance and those who rate it relatively low remain the same over time. Low rank-order stability indicates that the individuals who rate the value relatively high and relatively low change their relative positions over time. Examining rank-order stability through the life course may shed light on when and why interindividual differences in value importance tend to become more or less consistent.

Finally, *ipsative (or profile) stability* refers to the degree to which a person's value hierarchy (i.e., the relative importance that an individual ascribes to the ten values) changes over time. Earlier research on values commonly analyzed mean-level change and rank-order stability (e.g., Bardi et al., 2009; Cieciuch et al., 2016; Hofmann-Towfigh, 2007; Milfont et al., 2016; Schwartz, 2005; Vecchione, Caprara, Dentale & Schwartz, 2013). The profile stability of values, however, has rarely been studied (Sundberg, 2016; Vecchione et al., 2016a), and never in samples of children. Yet, as Vecchione et al. (2016a) argue, changes within the value hierarchy/profile of individuals may have significant implications. Change in the values that are considered most important (i.e., the ones at the top of the hierarchy) are likely to affect behavior because these values are more accessible and thus more likely to be activated (Bardi & Goodwin, 2011; Schwartz, 2015; Verplanken & Holland 2002). Thus, the stability of an individual's value hierarchy may be paramount in fostering the stability of behavior.

Past research on stability and change of basic personal values in childhood and adolescence

As noted above, numerous studies of adults have examined changes in value priorities during major life stages and transitions. Findings have revealed substantial stability over time for the ten values, in most cases comparable to the stability observed for the Big Five (e.g., Dobewall & Aavik, 2016). The few studies discussed below used longitudinal data to examine

stability and change of values at earlier developmental stages, in samples of children or early adolescents.

Hofmann-Towfigh (2007) investigated value change in a sample of 719 German students aged 11 to 21 years. She administered the Portrait Values Questionnaire (PVQ, Schwartz, 2006) at the beginning of the school year and 10 months later. Power and achievement values became significantly more important and benevolence and universalism values became less important over the 10-month period. Rank-order stability coefficients of the ten values ranged from .72 (self-direction) to .82 (conformity). It is impossible to attribute the observed changes unequivocally to a specific developmental phase, however, because the sample was highly heterogeneous in age and because age and cohort effects may have been confounded.

Cieciuch et al. (2016) administered the Picture Based Values Survey (PBVS-C, Döring et al., 2010) to a sample of 801 Polish children, divided into five cohorts, from 7 to 11 years. They collected data in primary schools on three occasions, with one-year intervals between measurements. The study investigated the four higher order values. They displayed moderate mean-level stability over the two years of the study. Openness to change increased in importance whereas conservation tended to decrease. Self-transcendence and self-enhancement exhibited more discontinuous patterns of weaker and non-linear change that was less consistent across cohorts. Two-year rank order stability estimates for the four higher order values ranged from .19 (openness to change) to .39 (self-enhancement).

Vecchione, Döring, Marsicano, Alessandri, and Bardi (2016b) administered the PVQ to a sample of 310 eleven-year-old Italian students. They collected three waves of data, each approximately three months apart. Rank-order stability coefficients over a six-month interval for the four higher order values ranged from .52 (conservation) to .75 (self-enhancement). The

study, however, focused on the reciprocal relations between values and behavior, thus providing only limited information about patterns of value change.

Daniel and Benish-Weisman (2018) administered the PVQ to a sample of about four hundred Jewish and Arab Israeli students. Data were collected annually over four years, from early to middle adolescence (i.e., from about 14 to 17 years of age), during the transition from junior to high school. Tradition values decreased in importance over the three years of the study whereas power values increased. Self-direction values also increased, but only among Jewish adolescents. The three-year rank-order stability coefficients for the ten values ranged from .26 (benevolence) to .51 (power) for Jewish adolescents, and from .14 (self-direction, conformity) to .38 (power) for Arab adolescents.

The current study

Earlier research has provided important insights on value change and stability at early ages. However, additional studies are needed to get a broader and more comprehensive view of value development. The present research adds to the literature by examining how the ten values change over two years during early adolescence. It analyzes the same sample as Vecchione et al. (2016b), but examines different aspects of the data and covers six rather than three waves.[2] Thus, it covers a longer developmental period through the junior high school years, from ages 10 to 12. The only study that addressed stability and change of values during this early developmental stage is the one by Cieciuch et al. (2016). That study, however, investigated change only for the four broad, higher order values. It therefore shed no light on how the whole set of the ten values change during early adolescence.

[2] Vecchione et al. (2016) studied reciprocal relations between values and behavior and did not investigate value change.

As noted, we examine mean-level, rank-order, and ipsative stability for the ten values. Furthermore, we investigate potential effects of gender in moderating the patterns of stability and change. We employ analytical approaches similar to those in a recent longitudinal study of value development in young adulthood (Vecchione et al., 2016a).

Research hypotheses

Early adolescence is often described as a developmental stage of major biological, cognitive, social, and motivational changes that profoundly impact adolescents' lives, a period of *storm and stress* (Wigfield, Byrnes & Eccles, 2006). Recent literature questions this view, however. Growing empirical evidence indicates that changes in personality during early adolescence are generally moderate in magnitude (e.g., De Fruit et al., 2006; Göllner et al., 2017). We therefore expect only moderate changes in the average importance that early adolescents attribute to the ten values and substantial levels of rank-order consistency over the period of study. Moreover, we expect the hierarchical ordering of the ten values to be quite stable for most individuals.

What form might the mean-level changes in the importance of the ten values take in early adolescence? This developmental period is marked by an increased desire for self-expression and autonomy, especially in the relationships with parents (Bosma et al., 1996; Paikoff & Brooks-Gunn, 1991), and an increased tendency to engage in novel, exciting or risky experiences (e.g., Collado, Felton, MacPherson & Lejuez, 2014; Harden & Tucker-Drob, 2011; Meeus, 2011). We therefore expect a moderate increase in the importance assigned to values that emphasize independence of thought and action (self-direction) and excitement, novelty and challenge in life (stimulation). This expectation aligns with results of neurobiological studies on the role of rising levels of pubertal hormones on responsiveness to rewarding and exciting experiences (e.g.,

Forbes & Dahl, 2010; Van Leijenhorst et al., 2010). With the emergence of puberty and the accompanying increase in sexual arousal and interest (Fortenberry, 2013, 2014), we might also expect an increase in hedonism values, which emphasize pleasure and sensuous gratification (Schwartz, 1992, 2005). The expected pattern would be consistent with results of an earlier, cross-sectional study (Tulviste & Tamm, 2014) in which hedonism and stimulation values ranked first and second in importance for Estonian early adolescents. This contrasts with the low importance of these two values for adults in the pan cultural value hierarchy (8th and 9th) reported by Schwartz and Bardi (2001).

Based on the circular structure of Schwartz's model, the expected increased importance of self-direction, stimulation, and hedonism values would imply a concomitant decline for the opposing values of conformity, tradition, and security. This would be consistent with the developmental patterns in the importance of the higher order values observed in a previous study of early adolescence, in which openness to change increased and conservation decreased over time (Cieciuch et al., 2016).

Regarding the other values, it is more difficult to offer clear-cut, theory-based predictions. The available empirical evidence regarding mean-level change in these values during adolescence is mixed. Cieciuch et al. (2016) reported that the higher-order self-transcendence value decreased in importance and the self-enhancement value increased in two cohorts of 9- and 10-year old children over the two years of their study. However, in a cohort of 11-year old children, there was no change in these two higher order values. Daniel and Benish-Weisman (2018) found that power values increased in importance from early to middle adolescence, whereas achievement, universalism and benevolence values did not change. We therefore expect a slight decrease in early adolescence for universalism and benevolence, and a

concomitant increase for power and achievement. This prediction comports with findings of a decrease in the agreeableness trait in the transition from late childhood to early adolescence (Göllner et al., 2017; Soto, John, Gosling & Potter, 2011; Van den Akker, Deković, Asscher, & Prinzie, 2014). It also fits with Carlo et al.'s (2007) argument that the difficulties and pressures encountered at the beginning of secondary school may lead early adolescents to invest increased amounts of time and effort in activities related to their personal success and achievement.

We expect a linear pattern of change for the ten values during the three years of junior high school, a period of relative continuity in the social and educational environment. Moderate deviations from linearity, however, are possible. Such deviations may become progressively more likely as the number of waves increases (Preacher, Wichman, MacCallum & Briggs, 2008).

Next, consider gender differences. Empirical evidence from numerous countries reveals a tendency for females to attribute more importance than males to benevolence, universalism, and security values, and for males to attribute more importance than females to power, achievement, stimulation, hedonism, and self-direction values (e.g., Schwartz & Rubel, 2005). Recent studies report that this gender gap emerges relatively early in life, around ages 7-11 (Döring et al., 2015). We therefore expect these gender differences to replicate at T1, when our participants were aged 10-12. However, we expect no gender differences in patterns of mean-level change over the two years of the study. This would also accord with earlier results on higher order values among children (Cieciuch et al., 2016).

Methods

Participants

This study is part of an ongoing longitudinal project that investigates children’s motivation and personality development. The project involves a sample of 382 Italian students,

drawn from several public schools in Southern Italy. Students were assessed at six time points during the three years of junior high school.[3]

Whereas earlier studies employed time lags of one year or so, we decided to adopt shorter intervals, ranging approximately between 3 and 6 months, thereby increasing the number of measurements. This allowed to test for potential short term changes that may occur, among other things, as a result of environmental fluctuations. Such changes might remain undetected or be underestimated when using large time intervals between occasions (Luhmann et al., 2014). Moreover, increasing the number of waves improves the reliability of the estimated growth-rate (Willett, 1989) and makes it possible to explore complex, nonlinear patterns of change (MacCallum, Kim, Malarkey & Kiecolt-Glaser, 1997; Preacher et al., 2008).

The age of the sample at the first assessment point (T1) ranged from 10 to 12 years (M = 10.67, SD = .58). Study participation varied slightly across assessments due to fluctuations in students' absence from school and minimal variations in the composition of classes. In total, 360 pupils (94%) completed at least two of the six waves of data collection, and 328 (86%) completed at least three waves. Little's (1988) test was performed to assess for randomness of missing data. The test yielded non-significant results, $\chi^2(1290) = 1285.18$, $p = .53$, suggesting that the pattern of missing data meets the completely at random (MCAR) assumption. Table 1 reports the school year, period of data collection, sample size and gender composition at each assessment point.

Procedures and Measures

A trained researcher administered self-report questionnaires in classrooms of participating schools. Parents received a consent letter informing them about the study and

[3] Junior high school in Italy is compulsory. Public schools are free of charge and there is no selection in terms of ability or previous grades. The educational curriculum is the same for all pupils.

enabling them to withdraw their child (the so-called opt-out method) if they wished (none did). The questionnaires included the PVQ items plus several other instruments unrelated to the current study. The PVQ appeared in the middle of the questionnaire battery, in approximately the same position at each time point. Given the young age of the participants, the researcher provided examples in response to requests for clarification during the sessions.

Basic Values. We measured basic values with the Portrait Values Questionnaire (PVQ, Schwartz, 2006). The PVQ includes 40 short verbal portraits describing a person's goals, aspirations, or wishes that point implicitly to the importance of a value. For example: "She believes she should always show respect to her parents and to older people". For each portrait, children were asked to indicate how similar they are to this person on a 6-point scale ranging from "not like me at all" to "very much like me". Children's values were inferred from the values of the people they consider similar to themselves. The more similar they consider themselves to a portrait, the more important the value expressed in this portrait is to them.

The PVQ has been used with children aged 11 years or younger only rarely (e.g. Knafo & Spinath, 2011). We therefore pre-tested the PVQ with study participants three months before T1 to check the items for clarity. As Vecchione et al. (2016b) describe, questions and comments during the pre-test helped to identify words that the children found difficult to understand. Half of the original items were slightly modified by paraphrasing or replacing these words with appropriate synonyms.[4]

To assess the factor structure of the PVQ in the present sample, we ran a Confirmatory Factor Analysis (CFA) on the 40 items of the instrument at T1. The model posits 10 oblique value factors, each measured with respective marker items. Covariances between uniquenesses

[4] The modified version of the PVQ is available upon request from the corresponding author

and secondary loadings were not allowed. The SRMR and RMSEA fit indexes showed close fit, but the CFI was slightly below the minimum requirement of .90: $\chi^2(695) = 1001.56$, $p < .001$, CFI =.89, RMSEA =.04, 90% CI [.03, .04], SRMR =.06. This might be due to the large number of variables in the model. Some studies have shown that the CFI tends to worsen as the number of variables increases, even in correctly specified models (Kenny & McCoach, 2003). Standardized factor loadings were all highly significant ($p < .001$), ranging from .33 to .77 (M = .56; SD = .11). A Multidimensional Scaling (MDS) on the 10 PVQ indexes at T1 showed that the order of values around the circle follows the motivational order predicted by the theory. The online Appendix A provides details of the analysis and the MDS plot.

Cronbach's alpha reliability estimates ranged from .67 (T6) to .77 (T2) for security, from .62 (T1) to .75 (T6) for conformity, from .49 (T4) to .60 (T3) for tradition, from .69 (T4) to .78 (T3) for benevolence, from .75 (T1) to .82 (T4) for universalism, from .43 (T4) to .55 (T1) for self-direction, from .46 (T4) to .60 (T6) for stimulation, from .54 (T4) to .69 (T2) for hedonism, from .68 (T1) to .80 (T4) for achievement, and from .65 (T2) to .69 (T3) for power. These coefficients are similar to those reported in studies of adults (e.g., Schwartz, 2005), with the exception of self-direction and stimulation values, whose internal consistency was slightly lower.

Statistical Analyses

We first evaluated longitudinal and gender invariance of the PVQ, using CFA. We assessed configural, metric, and scalar levels of invariance. These are required for subsequent analyses to be meaningful. Configural invariance is supported if the same factor structure holds over time and across gender. This is a pre-condition for other, stricter levels of invariance. Metric invariance is required to conclude that the measurement unit is the same at each wave and in

each gender group. When full metric invariance is not supported, we tested for partial metric invariance, by releasing the constraints on the items that turned out not to be invariant. Scalar invariance is required to establish that scores have the same origin at each wave and in each gender group. When full scalar invariance is not supported, we tested for partial scalar invariance. The intercepts of the items that that are not metrically invariant were left unconstrained (Steenkamp & Baumgartner, 1998). Given the large number of parameters to be estimated in these models, we tested longitudinal and gender invariance separately. Moreover, we ran separate CFAs on the items of the PVQ, one for each value.

Missing data were handled through full information maximum likelihood (FIML), using the *type is missing* option in Mplus 6.1 (Muthén & Muthén, 2010). Model fit was assessed with chi-square statistics, the Comparative Fit Index (CFI), the Root Mean Square Errors of Approximation (RMSEA), and the Standardized Root Mean Square Residuals (SRMR). We relied on the χ^2 difference test to assess different levels of measurement invariance, by comparing the fit of increasingly more restricted models. More lenient criteria are available for testing model invariance (e.g., Chen 2007). Given our sample size, however, we preferred to rely on the χ^2 difference test, with an alpha level of .01, because it adequately controls the Type I error rate and provides relatively high statistical power (French & Finch, 2006).

We modeled mean-level change with latent growth curve (LGC) models (Duncan, Duncan & Strycker, 2011). For each of the ten values we tested three alternative two-factor (intercept, slope) LGC models. In each model, we fixed all the intercept factor loadings to 1, the first slope factor loading to 0, and the last slope factor loading to 1. This allowed us to define the intercept as the importance attributed to values at T1, and the slope as the change in the importance attributed to values from T1 to T6.

Model 1 (No-Mean Growth) posited that, on average, there was no change over time, although there could be significant variability around the average trajectory. We defined a linear trajectory for this model. For this purpose, we fixed the T2, T3, T4, and T5 slope factor loadings to .14, .23, .45, and .77, respectively. This reflects the timing of data collection. Moreover, we fixed the mean of the slope factor to zero and allowed its variance to be freely estimated. Model 2 (Linear Growth) posited a linear pattern of change over time with systematic variability around the average trajectory. It differed from Model 1 only in allowing the mean of the slope to be freely estimated. Model 3 (Non-Linear Growth) permits capturing non-linear patterns of change. It differed from Model 1 and Model 2 in allowing deviations from linearity in the rate of change over time. This is achieved by freeing the T3, T4, and T5 slope factor loadings. The fit of competing models was compared by means of the χ^2 difference test.

After establishing the best-fitting growth curve model, we included gender (coded 0= male, 1= female) as a covariate of the growth curve elements (i.e., the intercept and the slope). This allowed us to examine potential differences between males and females in the growth trajectory of the ten values.

We assessed rank-order stability by examining the correlations over time of each of the ten values. Correlations were calculated between each pair of adjacent waves (T1-T2, T2-T3, T3-T4, T4-T5, and T5-T6), and between the first and last waves (T1-T6). Rank-order stability coefficients were calculated at the level of latent factors, thus controlling for measurement error. They reflect the relative stability of each value when scale unreliability was taken into account (see Asendorpf, 1992).

Finally, we assessed the within-person stability of the value hierarchy (i.e., ipsative/profile stability) by computing Spearman rank correlations between the individual's importance ordering

of the ten values at each time point and his/her importance ordering at other times. This enabled us to evaluate the extent to which the order of importance of the ten values was maintained over time. Specifically, we calculated six correlations per respondent, one for each pair of adjacent waves (T1-T2, T2-T3, T3-T4, T4-T5, and T5-T6), and one that assessed the stability of the value hierarchy over the entire study period (T1-T6). To illustrate the procedure, consider an example. At time *t*, the scores of a hypothetical individual *i* on the ten values were: universalism = 4.9, benevolence = 4.5, tradition = 3.6, conformity = 3.3, security = 3.2, power = 2.2, achievement = 2.6, hedonism = 2.8, stimulation = 2.9, self-direction = 4.0. At time *t + 1*, the scores of the same individual *i* were: universalism = 4.2, benevolence = 4.1, tradition = 3.8, conformity = 3.7, security = 3.6, power = 3.2, achievement = 3.3, hedonism = 3.4, stimulation = 3.5, self-direction = 3.9. Some change occurs for this individual. For example, power and achievement increased in importance, while universalism and benevolence decreased. However, the order of importance among the ten values remained the same. In this case, the Spearman rank correlation between time *t* and time *t + 1* is 1.00. We based these analyses on factor score estimates because changes in the value hierarchy might otherwise result from unreliability of the measures.

Results

Descriptive statistics

Table 2 provides the means and standard deviations of the ten values for each wave and the significance and size of the change from T1 to T6. The importance of the three openness to change values (self-direction, stimulation, and hedonism) increased as did the importance of the two self-enhancement values (achievement and power). The magnitude of change over the entire study period for these values ranged from small to moderate. The importance of the other five values did not change significantly.

Measurement invariance tests

Longitudinal invariance. The configural invariance models provided a good model fit for all values, supporting the assumption that the PVQ scales represented the same latent constructs over time. Metric invariance was fully supported for nine of the ten values. For self-direction, relaxing one equality constraint yielded partial metric invariance. Full scalar invariance was supported only for stimulation values. By releasing some constraints on the intercepts, it was possible to attain partial scalar invariance for the other nine values. Specifically, we released between one (benevolence, security, achievement) and a maximum of five (tradition, self-direction) equality constraints to achieve partial scalar invariance. Overall, at least one item intercept per scale, besides the one fixed to 0 for identification purposes, was invariant across all waves. This is a sufficient condition to perform meaningful comparisons of means. The online Appendix B provides details of the measurement invariance tests across waves.

Gender invariance. Metric invariance was fully supported for eight of the ten values. For tradition and power, relaxing one equality constraint yielded partial metric invariance. Full scalar invariance was supported for security, achievement, hedonism, universalism, and benevolence. After releasing an equality constraint on one intercept, partial scalar invariance was attained for conformity, self-direction, and stimulation. The online Appendix C provides details of the measurement invariance tests across gender.

Mean-level change

The left-panel of Table 3 reports the goodness of fit indexes for the alternative growth curve models. The right-panel of Table 3 reports the results of the χ^2 difference test used to compare these models. Table 4 reports the parameter estimates (the means and variances of the

intercept and slope factors) of the best-fitting models, namely the model that best represents the developmental trajectory of each value.

Conservation values. The model that best represents the nature of change for security and conformity values was the no-mean growth model. For tradition values, the non-linear model fit the data significantly better than alternative models. As shown in Table 4, the mean of the slope, which reflects the direction and the amount of change, was negative and significantly different from zero (-.08, $p<.05$). This indicates that the importance of tradition values decreased over time. A small but significant deviation from normality was observed from T4 to T5, however, where the mean score decreased more than would be expected if the trajectory were linear. Overall, the amount of change from T1 to T6 was modest (Cohen's d = -.09). Figure 1, panel A, presents the observed means and estimated growth trajectories for security, tradition, and conformity values.

Self-transcendence values. Benevolence and universalism were stable over time from T1 to T6. For both values, the no-mean growth model was preferred because its chi-square did not differ significantly from the chi-square of the other, less parsimonious, models. Figure 1, panel B, presents the observed means and estimated growth trajectories for the self-transcendence values.

Self-enhancement values. Power and achievement increased significantly (Figure 1, panel C). The best-fitting model for power indicates a linear increase from T1 to T6. The mean of the slope factor was .18, $p <.001$ (Cohen's d = .16). The non-linear model had the best fit for achievement values, which also increased over time. The mean of the slope factor was .20, $p <.001$ (Cohen's d = .17). The only significant deviation from normality was observed from T3 to T4, where the mean score increased slightly more than during the other intervals.

Openness to change values. Self-direction, stimulation and hedonism values all increased over time (Figure 1, panel D). For self-direction and hedonism, the linear model yielded the best fit. As shown in Table 4, the means of the slope were positive and significant, .25 for self-direction, p <.001 (Cohen's d = .30) and .13 for hedonism, p <.001 (Cohen's d = .29). This suggests that the importance ascribed to these values increased linearly across the six waves of the study. Stimulation values also increased, but the non-linear model fit significantly better than competing models. The mean of the slope factor was .22, p <.001 (Cohen's d = .22). Deviations from normality were observed from T2 to T3 and from T3 to T4, where mean scores increased more than during the other intervals.

All intercept factors of the best-fitting models had highly significant variances. This indicates that the importance attributed to each value at T1 varied considerably across participants. The variance in the slope factor was also significant for all values. Thus, there were significant individual differences in the estimated rate of growth of the ten values. Correlations between intercept and slope factors were consistently negative and significant for eight of the ten values. Similar results have been reported by Daniel and Benish-Weisman (2018). Thus, individuals who attributed lower importance to a given value at T1 were more likely to increase the importance they assigned to that value over time. Note, however, that this is a common pattern in LGC models that could represent a statistical artifact due to regression to the mean (Becht et al., 2016).

To examine whether gender might account for the variability in the growth parameters, we added gender as a predictor of the intercept and slope factors in the best fitting growth curve models. We found a significant effect on the intercept for six values: At T1, males rated power (β = -.41, p<.001) and achievement (β = -.40, p<.001) more important than females did and

females rated benevolence (β = .33, p<.001), universalism (β = .17, p<.001), security (β = .16, p<.01), and conformity (β = .20, p<.001) more important than males did. These gender differences were in line with those in the literature for adults (Schwartz & Rubel, 2005). However, gender had no significant effects on the slopes of the ten values. This indicated that the trajectory of change of values over the six waves of the study did not differ significantly between males and females.

Rank-order stability

Table 5 reports correlations over time for the ten latent value factors. These coefficients are derived from the scalar invariant models discussed earlier. Stability between adjacent waves was quite high for most values. Rank-order coefficients exceeded .70 in 86% of cases, with a mean of .78 (*SD* = .08, min = .58, max = .94). This high stability is not surprising, considering that correlations are based on relatively short time spans (4.4 months on average). More interestingly, stability coefficients over the two-year period from T1 to T6 averaged .57. They varied considerably across values (SD = .14). Stability was highest for power values (.77) and lowest for hedonism (.39).

Stability of within-person value hierarchies (profile stability)

Table 6 provides information about the stability of the value hierarchies of individuals (i.e., their value profiles) across time. It reports the sample mean, median, and other distributional properties of the within-person profile correlations of individuals for each pair of waves. When measured at adjacent time points, average stability was quite high: mean correlation coefficients ranged from .79 (T2-T3) to .84 (T5-T6) and median correlation coefficients ranged from .85 (T2-T3) to .90 (T5-T6). The distributions were negatively skewed, with a large positive kurtosis. This indicates that the hierarchy of values was substantially stable for most participants. Specifically,

for all pairs of adjacent waves, value hierarchy correlations were ≥. 94 for 75% of respondents. Although the typical profile found in this study is characterized by high levels of consistency, the profiles of a minority of participants changed substantially over time. Indeed, for the 5% of respondents with the least stability, correlations were ≤. 50 for T1-T2, ≤ .35 for T2-T3, ≤ .43 for T3-T4, ≤ .49 for T4-T5, and ≤. 52 for T5-T6.

Correlations between value hierarchies measured two years apart (T1-T6) ranged from -.27 to 1.00, with a mean of .66 (SD = .26) and a median of .72. This distribution was also non-normal, although much less markedly. Value hierarchy correlations were ≥ .85 for 75% of respondents, and ≤ .12 for 5% of respondents. Thus, only a small proportion of participants experienced a very marked change in their value hierarchy over the two years.

Discussion

The present study investigated stability and change of basic personal values over two years during early adolescence, a transitional life period accompanied by many developmental changes and challenges. To the best of our knowledge, this is the first study to apply multiple analytical approaches to analyze change in the whole set of 10 basic values during this developmental period.

At the mean-level, the three openness to change values were the values that changed most from age 11 to 13. As expected, these values increased in importance. Self-direction and hedonism values showed the greatest increase – about one third of a standard deviation, a medium effect size (Cohen, 1988). The two self-enhancement values, achievement and power, also increased significantly over time, but to a lesser extent (about one sixth of a standard deviation, a modest effect size). These patterns of change are in line with those reported by Cieciuch et al. (2016) for a sample of Polish early adolescents of the same age. They are also

consistent with the increase of power and self-direction values observed by Daniel and Benish-Weisman (2018) on a sample of Israeli middle adolescents.

Thus, it appears that openness to change and self-enhancement values are susceptible to change during adolescence. According to Schwartz‘s model (2006, 2009), these are the values that regulate the expression of individuals’ own interests and abilities. An increase in the importance assigned to these values is consistent with the heightened focus on one’s self said to characterize the period of adolescence (e.g., Elkind & Bowen, 1979; Peterson & Roscoe, 1991).

Regarding conservation and self-transcendence values, only tradition declined significantly. Contrary to our expectations, the other values were rather stable. These results are similar to those of Daniel and Benish-Weisman (2018), who also found decreasing importance of tradition and stable importance of conformity, security, universalism and benevolence values. These results largely differ from those of Cieciuch et al. (2016), who reported a trend of decreasing importance for both conservation and self-transcendence values.

Interestingly, we observed a systematic, though not significant, trend for both conservation and self-transcendence values to increase in importance at T3 (see Figure 1, panels A-B). We suggest a possible explanation for this surprising variation from the general pattern of mean stability for these values. During the T3 period of data collection (end of May 2013), pupils were working on a school project entitled “The birth of the Italian Republic.”[5] Pupils engaged in discussing articles about the Italian constitution, creating posters, writing poems, or preparing theatrical performances. They were invited to present the products of their work publicly to parents, teachers, and local authorities on the *Republic Day* on June 2nd. Perhaps, participation in this project, which celebrated their shared social identity, had a priming effect on

[5] The 2nd of June is the *Republic Day* in Italy, a national holiday that celebrates the creation of the Republic of Italy after World War II (https://en.wikipedia.org/wiki/Festa_della_Repubblica).

values that, according to Schwartz's model, mostly concern outcomes for others or for established institutions (Schwartz et al., 2012). The increased importance of conservation and self-transcendence values at T3 was short-lived, returning to their baseline at T4, T5, and T6. This post hoc explanation fits the argument of Bardi and Goodwin (2011) that short-term changes in values may occur as a function of increased accessibility in response to single events or environmental cues.

Overall, patterns of mean-level changes in the ten values were only partly consistent with the circular structure of the value system. The three adjacent openness to change values (self-direction, stimulation, and hedonism) did exhibit a shared trend of increasing importance, and the conflicting value of tradition changed in the opposite direction. However, the other conservation values (conformity and security) did not change significantly in this opposite direction. The expected pattern of change in opposite directions (i.e., negative interdependence) also did not occur for self-enhancement vs. self-transcendence values: Although power and achievement increased in importance over time, universalism and benevolence did not change. Further research is needed to clarify whether these deviations from the expected pattern replicate for this age period. Might they relate to the key developmental task of identity formation and the uncertainty about one's sense of self common during this period (e.g., Becht et al., 2016; Erikson, 1968)?

It is important to note, however, that deviations from the expected pattern of opposing changes in values at the group mean-level might obscure the processes at the intraindividual level. The approach used in the present study does not permit modeling the variability between individuals in patterns of change. A further limitation is the use of a sample of convenience, within a single geographical area (Southern Italy). Future studies, using Latent Class Growth

Analysis on larger and representative samples would permit identifying distinct and homogeneous clusters of developmental trajectories. This would further enhance our understanding of the mechanisms that underlie stability and change in the ten values during early adolescence.

Next, we compare the patterns and magnitude of value change we found for early adolescence with those found in studies of older cohorts. A meaningful comparison is possible only with longitudinal studies that followed a single age-cohort for a period of at least two years. Two studies meet this criterion, Myyry et al., (2013) and Vecchione et al. (2016a). Both of these studies examined the period of early adulthood, using the PVQ-40. The two studies found patterns of change in the ten values that were quite different from what observed for early and middle adolescence. Myyry et al. (2013) examined value change in a sample of 132 Finnish university students (Mean age = 23.4 years) from the beginning to the end of their studies. Security and universalism values became more important during the three years covered by the study whereas achievement became less important. The means of the other values did not change significantly. Vecchione et al. (2016a) examined a sample of 270 Italian adults, aged 20 or 21 at Time 1. The study included three waves of data, separated by 4-year intervals. Conservation, self-transcendence, and power values became more important over time, achievement values became less important, and openness to change values were stable.

All in all, the findings across these studies, those of Daniel and Benish-Weisman (2018) and ours offer a picture of changes in value importance from early adolescence through early adulthood. Openness to change values increased during early and middle adolescence and were largely stable in early adulthood. The increase appeared to be most pronounced for self-direction values, perhaps reflecting the growing desire for independence and autonomy during

adolescence. Self-transcendence values exhibited the opposite pattern. They were relatively stable during early and middle adolescence and increased thereafter through the twenties. Conservation values had stable or decreasing trajectories during early and middle adolescence and then increased, perhaps in response to the growing demands on young adults to adapt to socially prescribed roles (cf. Vecchione et al., 2016a). The two self-enhancement values appeared to follow different developmental trajectories. Power increased across the entire period from early adolescence to early adulthood. Achievement increased in early adolescence, was stable in middle adolescence, and decreased thereafter.

The findings from the various studies are largely compatible with the maturity principle of personality development (Borghuis et al., 2017; Caspi, Roberts, & Shiner, 2005). This principle implies that, during adulthood, attributes that promote functioning in society and social relations tend to increase. Regarding values, Schwartz (2012) argues in this vein that, during early adulthood, people tend to become progressively more committed to values that emphasize avoiding conflict and violation of norms, values that promote harmonious social relations and facilitate the smooth functioning of groups or the society as a whole. This is not the case at earlier ages, however. Value change in early and middle adolescence did not trend in the direction of greater maturity.

Interestingly, mean levels of personality traits appear to show a similar pattern of change through the life course. Several studies have observed that mean levels of socially adaptive traits, such as agreeableness, conscientiousness, and emotional stability, increase from middle to late childhood, decline from late childhood to middle adolescence, and increase again thereafter (e.g., Denissen, Van Aken, Penke, & Wood, 2013; Soto et al., 2011; Van den Akker et al., 2014). The

distinctive pattern of change observed in the transition to adolescence has been referred to as a temporary defiance of the maturity principle (Van den Akker et al., 2014).

The picture we have drawn is, of course, speculative. It ignores possible cultural differences between Finland, Israel, and Italy, where the studies were conducted. Moreover, it pieces together longitudinal data from different individuals across various developmental stages. This is only a start. Understanding the developmental trajectory in the importance of basic values across the life course will require much longer-term longitudinal studies in a variety of societies. Future research should test the generalizability of the current findings and extend the time span covered.

Comparing the magnitude of value change in the various longitudinal studies entails some uncertainty because the samples and time spans differed. The magnitude of mean-level change for the early adolescents in our study appears to be similar to that observed during middle adolescence and early adulthood. In the present study, Cohen's d for change in the ten values over two years of early adolescence averaged .14. In the Daniel and Benish-Weisman (2018) study of middle adolescents, Cohen's d averaged .10 (SD = .07) over three years. In the Myyry et al. (2013) and Vecchione et al (2016a) studies of early adults it averaged .15 over three and four years, respectively.

At first glance, one may be tempted to conclude that value change among early adolescent individuals in our study was relatively modest. However, two considerations argue against this conclusion. First, as Asendorpf (1992) noted, "stability does not reflect an absence of intra-individual change, but an absence of inter-individual differences in intra-individual change" (p. 104). This was indeed the case in our data. There was highly significant variability around the average growth trajectory for every one of the ten values, as revealed by the variances of the

slope factor in the LGC models. Similar results were found by Daniel and Benish-Weisman (2018). They reported significant variability in the slope factor for seven of the ten values. This indicates that intra-individual value change differed substantially across adolescence. Such heterogeneity appeared to be higher than that reported in the Vecchione et al. (2006a) study of young adults. The variance in the slope factor in that study was significant for only four of the ten values.

Second, stability in values, as in any personality disposition, depends to some degree on the stability of the individual's environment. Personality tends to remain relatively consistent when individuals live in a stable and predictable environment (Caspi, 1993). Personality is more susceptible to change in unstable, fluctuating environments (Sturaro, Denissen, van Aken & Asendorpf, 2008). This is certainly true for basic values. Although generally quite stable, they have been shown to change in response to major shifts in life circumstances (Bardi et al., 2014; Bardi & Goodwin, 2011; Daniel et al., 2013). The period we examined, from the beginning to the end of the junior high school, is a period of relative stability in the Italian education system. Children typically remain in the same classroom with the same teachers and peers during these years. This may have promoted value stability. Consequently, the present study may underestimate value change during early adolescence. Change is likely to be greater for pupils of this age in settings that require adapting to novel social and learning environments.

Regarding rank-order stability, coefficients observed in the present study were mostly in a moderate range, although with some variability across the ten values. After correcting for measurement error, the two-year stability coefficients averaged .57 (*SD* = .14). These coefficients for early adolescents were substantially higher than those observed among middle adolescent Israeli pupils (*M* = .31, *SD* = .11) over a three-year period (Daniel & Benish

Weisman, 2018). We would not take this as evidence that rank-order stability of values is higher in early adolescence than in the following years of middle adolescence. The current Italian study used latent variables that controlled for unreliability of measurement (Bollen, 1989); the Israeli study did not. Moreover, the Israeli study covered the period of transition from junior to high school, a time of major environmental change.

Interestingly, the rank-order stability coefficients in both early and middle adolescence tended to be lower than in studies of early adulthood, even though the time span was shorter. Among Finnish university students, coefficients averaged .67 (*SD* = .05) over a three-year period (uncorrected for measurement error) (Myyry et al., 2013). Among young Italian adults, coefficients averaged .74 (*SD* = .07) over a four-year period (corrected for measurement error) (Vecchione et al., 2016a). This parallels findings of increasing rank-order stability for personality traits from early adolescence to middle adulthood (Roberts & DelVecchio, 2000).

A further interesting finding is that rank-order stability coefficients in our sample varied substantially across the ten values. Stability was high (>.7) for some values (e.g., power, self-direction), moderate (.4-.7) for others (e.g., tradition, benevolence), and lowest (<.4) for hedonism. Eighty-five percent of the variance in hedonism [$.85 = (1 - .39^2)$] differed over the two years between T1 and T6. This suggests a strong tendency for individual early adolescents to shift their relative position in the group in the importance they ascribe to hedonism. The individual differences in shifting relative positions on the importance of hedonism may relate to differences in the age at which pubertal changes occur and in the strength of the effects of pubertal change in each adolescent's life.

Finally, consider the findings for profile stability, the stability of each individual's own value hierarchy over time. For most participants, there was moderate to high consistency over

time in their hierarchy of the ten values. Yet, a small proportion of participants showed substantial instability. This was also the finding in a sample of young Italian adults (Vecchione et al., 2016a). The low profile stability of this minority of participants may have been due to experiencing potent life-changing events (e.g., parental death or divorce, a serious disease or accident, sudden economic deprivation) to which they had to adapt. Adapting to such events often requires reorganizing one's value priorities (Bardi & Goodwin, 2011; Bardi et al., 2009). Systematic attempts to link life events to change in value hierarchies, however, are lacking (see Sundberg, 2016, for an exception). This is an important topic for future research.

Declaration of Conflicting Interests: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Acknowledgments. The 3rd and 4th authors would like to thank the University of Zurich Research Priority Program "Social Networks" for their support during work on this study.

References

Abramson, L., Daniel, E., & Knafo-Noam, A. (2018). The role of personal values in children's costly sharing and non-costly giving. *Journal of Experimental Child Psychology, 165*, 117-134. doi:10.1016/j.jecp.2017.03.007

Asendorpf, J.B. (1992). Beyond stability: predicting inter-individual differences in intra-individual change. *European Journal of Personality, 6*, 103-117. doi:10.1002/per.2410060204

Ball-Rokeach, S.J., Rokeach, M., & Grube, J.W. (1984). *The Great American Values Test: influencing behavior and belief through television.* New York: Free Press.

Bardi, A., Buchanan, K.E., Goodwin, R., Slabu, L., & Robinson, M. (2014). Value stability and change during self-chosen life transitions: Self-selection versus socialization effects. *Journal of Personality and Social Psychology, 106*, 131-147. doi:10.1037/a0034818

Bardi, A., & Goodwin, R. (2011). The dual route to value change: Individual processes and cultural moderators. *Journal of Cross-Cultural Psychology*, *42*, 271-287. doi:10.1177/0022022110396916

Bardi, A., Lee, J.A., Hofmann-Towfigh, N., & Soutar, G. (2009). The structure of intraindividual value change. *Journal of Personality and Social Psychology, 97*, 913-929. doi:10.1037/a0016617

Becht, A.I., Nelemans, S.A., Branje, S.J., Vollebergh, W.A., Koot, H.M., Denissen, J.J., & Meeus, W.H. (2016). The quest for identity in adolescence: Heterogeneity in daily identity formation and psychosocial adjustment across 5 years. *Developmental Psychology, 52*, 2010-2021. https://doi.org/10.1037/dev0000245 5. Klimstra, T. A., Hale, W. W., III, Raaijmakers, Q. A. W.,

Bilsky, W., Döring, A.K., van Beeck, F., Rose, I., Schmitz, J., Aryus, K., & ... Snidermann, J. (2013). Assessment of children's value structures and value preferences: Testing and expanding the limits. *Swiss Journal of Psychology, 72*, 123-136. doi:10.1024/1421-0185/a000106

Bilsky, W., Janik, M., & Schwartz, S.H. (2011). The structural organization of human values – Evidence from three rounds of the European Social Survey (ESS). *Journal of Cross-Cultural Psychology, 42,* 759-776. doi:10.1177/0022022110362757

Bollen, K.A. (1989). *Structural Equation Modelling with Latent Variables*. NY: Wiley.

Borg, I., & Groenen, P.J.F. (2005). *Modern multidimensional scaling* (2nd ed.). Springer.

Borghuis, J., Denissen, J.J.A., Oberski, D., Sijtsma, K., Meeus, W.H.J., Branje, S., … Bleidorn, W. (2017). Big Five personality stability, change, and codevelopment across adolescence and early adulthood. *Journal of Personality and Social Psychology*, 113, 641–657. http://doi.org/10.1037/pspp0000138

Bosma, H.A., Jackson, S.E., Zijsling, D.H., Zani, B., Cicognani, E., Lucia Xerri, M., & ... Charman, L. (1996). Who has the final say? Decisions on adolescent behaviour within the family. *Journal of Adolescence*, *19*, 277-291. doi:10.1006/jado.1996.0025

Byrne, B.M., Shavelson, R.J., & Muthén, B.O. (1989). Testing for equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin*, *105*, 456-466. doi:10.1037/0033-2909.105.3.456

Carlo, G., Crockett, L.J., Randall, B.A., & Roesch, S.C. (2007). A latent growth curve analysis of prosocial behavior among rural adolescents. *Journal of Research on Adolescence*, *17*, 301-324. doi:10.1111/j.1532-7795.2007.00524.x

Caspi, A. (1993). Why maladaptive behaviors persist: Sources of continuity and change across the life course. In D.C. Funder, R.D. Parke, C. Tomlinson-Keasey, K. Widaman, D.C. Funder, R.D. Parke, ... K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 343-376). Washington, DC, US: American Psychological Association. doi:10.1037/10127-031

Caspi, A., Roberts, B.W., & Shiner, R.L. (2005). Personality development: Stability and change. *Annual Review of Psychology, 56,* 453-484. doi:10.1146/annurev.psych.55.090902.141913

Chen, F.F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14,* 464-504. doi:10.1080/10705510701301834

Cieciuch, J., Davidov, E., & Algesheimer, R. (2016). The stability and change of value structure and priorities in childhood: A longitudinal study. *Social Development, 25,* 503-527. doi:10.1111/sode.12147

Cieciuch, J., Döring, A.K., & Harasimczuk, J. (2013). Measuring Schwartz's values in childhood: Multidimensional scaling across instruments and cultures. *European Journal of Developmental Psychology, 10,* 625-633. doi:10.1080/17405629.2012.707779

Cohen, J. (1988*). Statistical Power Analysis for the Behavioral Sciences (2nd Edition).* Hillsdale, NJ: Lawrence Erlbaum Associates.

Collado, A., Felton, J.W., MacPherson, L., & Lejuez, C. (2014). Longitudinal trajectories of sensation seeking, risk taking propensity, and impulsivity across early to middle adolescence. *Addictive Behaviors, 39,* 1580-1588. doi:10.1016/j.addbeh.2014.01.024

Daniel, E., & Benish-Weisman, M. (2018). Value development during adolescence: Dimensions of change and stability. *Journal of Personality, 87,* 620-632.

Daniel, E., Fortuna, K., Thrun, S.K., Cioban, S., & Knafo, A. (2013). Brief report: Early adolescents' value development at war time. *Journal of Adolescence, 36,* 651-655. doi:10.1016/j.adolescence.2013.03.009

De Fruyt, F., Bartels, M., Van Leeuwen, K.G., De Clercq, B., Decuyper, M., & Mervielde, I. (2006). Five types of personality continuity in childhood and adolescence. *Journal of Personality and Social Psychology, 91,* 538-552. doi:10.1037/0022-3514.91.3.538

Denissen, J.J.A., van Aken, M.A.G., Penke, L., & Wood, D. (2013). Self-regulation underlies temperament and personality: An integrative developmental framework. *Child Development Perspectives*, *7,* 255-260. doi:10.1111/cdep.12050

Dobewall, H., & Aavik, T. (2016). Rank-order consistency and profile stability of self- and informant-reports of personal values in comparison to personality traits. *Journal of Individual Differences*, *37,* 40-48. doi:10.1027/1614-0001/a000186

Döring, A.K. (2010). Assessing children's values: An exploratory study. *Journal of Psychoeducational Assessment*, *28,* 564-577. doi:10.1177/0734282909357151

Döring, A.K., Blauensteiner, A., Aryus, K., Drögekamp, L., & Bilsky, W. (2010). Assessing values at an early age: The Picture-Based Value Survey for Children (PBVS-C). *Journal of Personality* Assessment, 92, 439-448. doi:10.1080/00223891.2010.497423

Döring, A., Schwartz, S.H., Cieciuch, J., Groenen, P., Glatzel, V., Harasimczuk, ... & Bilsky, W. (2015). Cross-cultural evidence of value structures and priorities in childhood. *British Journal of Psychology*, *106,* 675-699. doi:10.1111/bjop.12116

Duncan, T.E., Duncan, S.C., & Strycker, L.A. (2011). *An introduction to latent variable growth curve modeling: Concepts, issues, and application (2nd Edition)*. NY: Routledge.

Elkind, D., & Bowen, R. (1979). Imaginary audience behavior in children and adolescents. *Developmental Psychology*, *15*, 38-44. doi:10.1037/0012-1649.15.1.38

Erikson, E.H. (1968). *Identity, youth and crisis*. New York: W.W. Norton.

Forbes, E.E., & Dahl, R.E. (2010). Pubertal development and behavior: Hormonal activation of social and motivational tendencies. *Brain and Cognition*, *72,* 66-72. doi:10.1016/ j.bandc.2009.10.007

Fortenberry, J.D. (2013). Puberty and adolescent sexuality. *Hormones and Behavior*, *64*, 280-287. doi:10.1016/j.yhbeh.2013.03.007

Fortenberry, J.D. (2014). Sexual learning, sexual experience, and healthy adolescent sex. In E.S. Lefkowitz & S.A. Vasilenko (Eds.), *New directions for child and adolescent development: Vol. 144. Positive and negative outcomes of sexual behaviors* (pp. 71-86). San Francisco, CA, US: Jossey-Bass.

French, B.F., & Finch, W.H. (2006). Confirmatory factor analytic procedures for the determination of measurement invariance. *Structural Equation Modeling*, *13*, 378-402. doi:10.1207/s15328007sem1303_3

Göllner, R., Roberts, B.W., Damian, R.I., Lüdtke, O., Jonkmann, K., & Trautwein, U. (2017). Whose 'storm and stress' is it? Parent and child reports of personality development in the transition to early adolescence. *Journal of Personality*, *85*, 376-387. doi:10.1111/jopy.12246

Goodwin, R., Polek, E., & Bardi, A. (2012). The temporal reciprocity of values and beliefs: A longitudinal study within a major life transition. *European Journal of Personality*, *26*, 360-370. doi:10.1002/per.844

Gouveia, V.V., Vione, K.C., Milfont, T.L., & Fischer, R. (2015). Patterns of value change during the life span: Some evidence from a functional approach of values. *Personality and Social Psychology Bulletin*, *41*, 1276-1290. doi:10.1177/0146167215594189

Harden, K.P., & Tucker-Drob, E. M. (2011). Individual differences in the development of sensation seeking and impulsivity during adolescence: Further evidence for a dual systems model. *Developmental Psychology*, *47*, 739-746. doi:10.1037/a0023279

Hitlin, S. (2003). Values as the core of personal identity: Drawing links between two theories of self. *Social Psychology Quarterly*, *66*, 118-137. doi:10.2307/1519843

Hofmann-Towfigh, N. (2007). Do students' values change in different types of schools? *Journal of Moral Education*, *36*, 453-473. doi:10.1080/03057240701688010

Kenny, D.A., & McCoach, D.B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling*, *10*, 333-351. doi:10.1207/S15328007SEM1003_1

Kluckhohn, C. (1951). Values and value-orientations in the theory of action: An exploration in definition and classification. In Parsons, T. & Shils, E., (Eds.), *Toward a general theory of action* (pp. 388-433). Harvard University Press, Cambridge.

Knafo, A., & Spinath, F.M. (2011). Genetic and environmental influences on girls' and boys' gender-typed and gender-neutral values. *Developmental Psychology*, *47*, 726-731. doi:10.1037/a0021910

Little, R.J.A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*, 1198-1202.

Lönnqvist, J., Jasinskaja-Lahti, I., & Verkasalo, M. (2011). Personal values before and after migration: A longitudinal case study on value change in Ingrian–Finnish migrants. *Social Psychological and Personality Science*, *2*, 584-591. doi:10.1177/1948550611402362

Luhmann, M., Orth, U., Specht, J., Kandler, C., & Lucas, R.E. (2014). Studying changes in life circumstances and personality: It's about time. *European Journal of Personality*, *28*, 256-266. 10.1002/per.1951

MacCallum, R.C., Kim, C., Malarkey, W.B. & Kiecolt-Glaser, J.K. (1997). Studying multivariate change using multilevel models and latent curve models. *Multivariate Behavioral Research, 32*, 215-253. doi:10.1207/s15327906mbr3203_1

Maio, G.R., Pakizeh, A., Cheung, W.-Y., & Rees, K.J. (2009). Changing, priming, and acting on values: Effects via motivational relations in a circular model. *Journal of Personality and Social Psychology, 97,* 699-715.doi: 10.1037/a0016420

Meeus, W. (2011). The study of adolescent identity formation 2000-2010: A review of longitudinal research. *Journal of Research on Adolescence, 21*, 75-94. doi:10.1111/j.1532-7795.2010.00716.x

Milfont, T.L., Milojev, P., & Sibley, C.G. (2016). Values stability and change in adulthood: A 3-year longitudinal study of rank-order stability and mean-level differences. *Personality and Social Psychology Bulletin*, *42*, 572-588. doi:10.1177/0146167216639245

Muthén, L.K., & Muthén, B.O. (2008). *Mplus user's guide*. Los Angeles, CA: Muthén & Muthén.

Myyry, L., Juujärvi, S., & Pesso, K. (2013). Change in values and moral reasoning during higher education. *European Journal of Developmental Psychology*, *10*, 269-284. doi:10.1080/17405629.2012.757217

Paikoff, R.L., & Brooks-Gunn, J. (1991). Do parent-child relationships change during puberty? *Psychological Bulletin*, *110*, 47-66. doi:10.1037/0033-2909.110.1.47

Peterson, K.L., & Roscoe, B. (1991). Imaginary audience behavior in older adolescent females. *Adolescence*, *26*, 195-20.

Preacher, K.J., Wichman, A.L., MacCallum, R.C., & Briggs, N.E. (2008). *Latent growth curve modeling*. Thousand Oaks, CA: Sage.

Roberts, B.W., & DelVecchio, W.F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*, *126*, 3-25. doi:10.1037/0033-2909.126.1.3

Roberts, B.W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. In O.P. John, R.W. Robins, & L.A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 375-398). New York, NY: Guilford.

Robinson, O.C. (2013). Values and adult age: Findings from two cohorts of the European Social Survey. *European Journal of Ageing, 10,* 11-23. doi:10.1007/s10433-012-0247-3

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Rokeach, M. (1974). Change and stability in American value systems, 1968-1971. *Public Opinion Quarterly, 38*, 222-238. doi:10.1086/268153

Schwartz, S.H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna, & M. P. Zanna (Eds.), *Advances in experimental social psychology, vol. 25* (pp. 1-65). San Diego, CA, US: Academic Press. doi:10.1016/S0065-2601(08)60281-6

Schwartz, S.H. (1996). Value priorities and behavior: Applying a theory of integrated value systems. In C. Seligman, J.M. Olson, & M.P. Zanna (Eds.), *The Ontario symposium on personality and social psychology*, Vol. 8. The psychology of values: The Ontario symposium, Vol. 8, (pp. 1-24). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Schwartz, S.H. (2005). Robustness and fruitfulness of a theory of universals in individual human values. In A. Tamayo, & J.B. Porto (Eds.), *Valores e comportamento nas organizacões* [*Values and behavior in organizations*] (pp. 56-95). Petrópolis, Brazil: Vozes.

Schwartz, S.H. (2006). Les valeurs de base de la personne: Théorie, mesures et applications. *Revue Française de Sociologie, 47*, 249-288. doi:10.3917/rfs.474.0929

Schwartz, S.H. (2009). Basic values: How they motivate and inhibit prosocial behavior. In M. Mikulincer, & P.R. Shaver (Eds.), *Prosocial motives, emotions, and behavior: The better angels*

of our nature (pp. 221-241). Washington, DC: American Psychological Association. doi:10.1037/12061-012

Schwartz, S. H. (2012). Values and religion in adolescent development: Cross-national and comparative evidence In G. Tromsdorff & X. Chen (Eds.), *Values, religion, and culture in adolescent development* (pp. 97-122). New York: Cambridge University Press.

Schwartz, S.H. (2015). Basic individual values: Sources and consequences. In D. Sander and T. Brosch (Eds.), *Handbook of value* (pp. 63-84). Oxford: UK, Oxford University Press.

Schwartz, S.H. (2017). The refined theory of basic values. In S. Roccas & L. Sagiv (Eds.), *Values and behavior: Taking a cross-cultural perspective* (pp. 51-72). Cham, Switzerland: Springer International Publishing.

Schwartz, S.H., & Bardi, A. (2001). Value hierarchies across cultures: Taking a similarities perspective. *Journal of Cross-Cultural Psychology*, *32*, 268-290. doi:10.1177/0022022101032003002

Schwartz, S.H., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., … & Konty, M. (2012). Refining the theory of basic individual values. *Journal of Personality and Social Psychology*, *103*, 663-688. doi:10.1037/a0029393

Schwartz, S.H., & Rubel, T. (2005). Sex differences in value priorities: Cross-cultural and multimethod studies. *Journal of Personality and Social Psychology*, *89*, 1010-1028. doi:10.1037/0022-3514.89.6.1010

Soto, C.J., John, O.P., Gosling, S.D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, *100*, 330-348. doi:10.1037/a0021717

Steenkamp, J.E.M., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Marketing Research, 25*, 78-90. doi:10.1086/209528

Sterling, P., & Eyer, J. (1988). Allostasis: A new paradigm to explain arousal pathology. In S. Fisher, J. Reason, S. Fisher, & J. Reason (Eds.), *Handbook of life stress, cognition and health* (pp. 629-649). Oxford, England: John Wiley & Sons.

Sturaro, C., Denissen, J.A., van Aken, M.A.G., & Asendorpf, J.B. (2008). Person-environment transactions during emerging adulthood: The interplay between personality characteristics and social relationships. *European Psychologist, 13*, 1-11. doi:10.1027/1016-9040.13.1.1

Sundberg, R. (2016). Value stability and change in an ISAF contingent. *Journal of Personality, 84*, 91-101. doi:10.1111/jopy.12142

Tulviste, T., & Tamm, A. (2014). Brief report: Value priorities of early adolescents. *Journal of Adolescence, 37*, 525-529. doi:10.1016/j.adolescence.2014.04.006

Uzefovsky, F., Döring, A.K., & Knafo-Noam, A. (2016). Values in middle childhood: Social and genetic contributions. *Social Development, 25*, 482-502. doi:10.1111/sode.12155

Van den Akker, A.L., Deković, M., Asscher, J., & Prinzie, P. (2014). Mean-level personality development across childhood and adolescence: A temporary defiance of the maturity principle and bidirectional associations with parenting. *Journal of Personality and Social Psychology*, 107, 736-750. doi:10.1037/a0037248

Van Leijenhorst, L., Moor, B.G., Op de Macks, Z.A., Rombouts, S.A.R.B., Westenberg, P.M., & Crone, E.A. (2010). Adolescent risky decision-making: Neurocognitive development of reward and control regions. *NeuroImage, 51*, 345-355. doi:10.1016/j.neuroimage.2010.02.038

Vecchione, M., Caprara, G.V., Dentale, F., & Schwartz, S.H. (2013). Voting and values: Reciprocal effects over time. *Political Psychology, 34*, 465-485. doi:10.1111/pops.12011

Vecchione, M., Döring, A.K., Alessandri, G., Marsicano, G., & Bardi, A. (2016b). Reciprocal relations across time between basic values and value-expressive behaviors: A longitudinal study among children. *Social Development, 25,* 528-547. doi:10.1111/sode.12152

Vecchione, M., Schwartz, S.H., Alessandri, G., Döring, A.K., Castellani, V., & Caprara, M.G. (2016a). Stability and change of basic personal values in early adulthood: An 8-year longitudinal study. *Journal of Research in Personality, 63,* 111-122. doi:10.1016/j.jrp.2016.06.002

Verkasalo, M., Goodwin, R., & Bezmenova, I. (2006). Values following a major terrorist incident: Finnish adolescent and student values before and after September 11, 2001. *Journal of Applied Social Psychology, 36,* 144-160. doi:10.1111/j.0021-9029.2006.00007.x

Verplanken, B., & Holland, R.W. (2002). Motivated decision making: Effects of activation and self-centrality of values on choices and behavior. *Journal of Personality and Social Psychology, 82,* 434-447. doi:10.1037/0022-3514.82.3.434

Wigfield, A., Byrnes, J.P., & Eccles, J.S. (2006). Development during early and middle adolescence. In P.A. Alexander, P.H. Winne, P.A. Alexander, & P.H. Winne (Eds.), *Handbook of educational psychology* (pp. 87-113). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Willett, J.B. (1989). Some results on reliability for the longitudinal measurement of change: Implications for the design of studies of individual growth. *Educational and Psychological Measurement, 49,* 587-602. doi:10.1177/001316448904900309

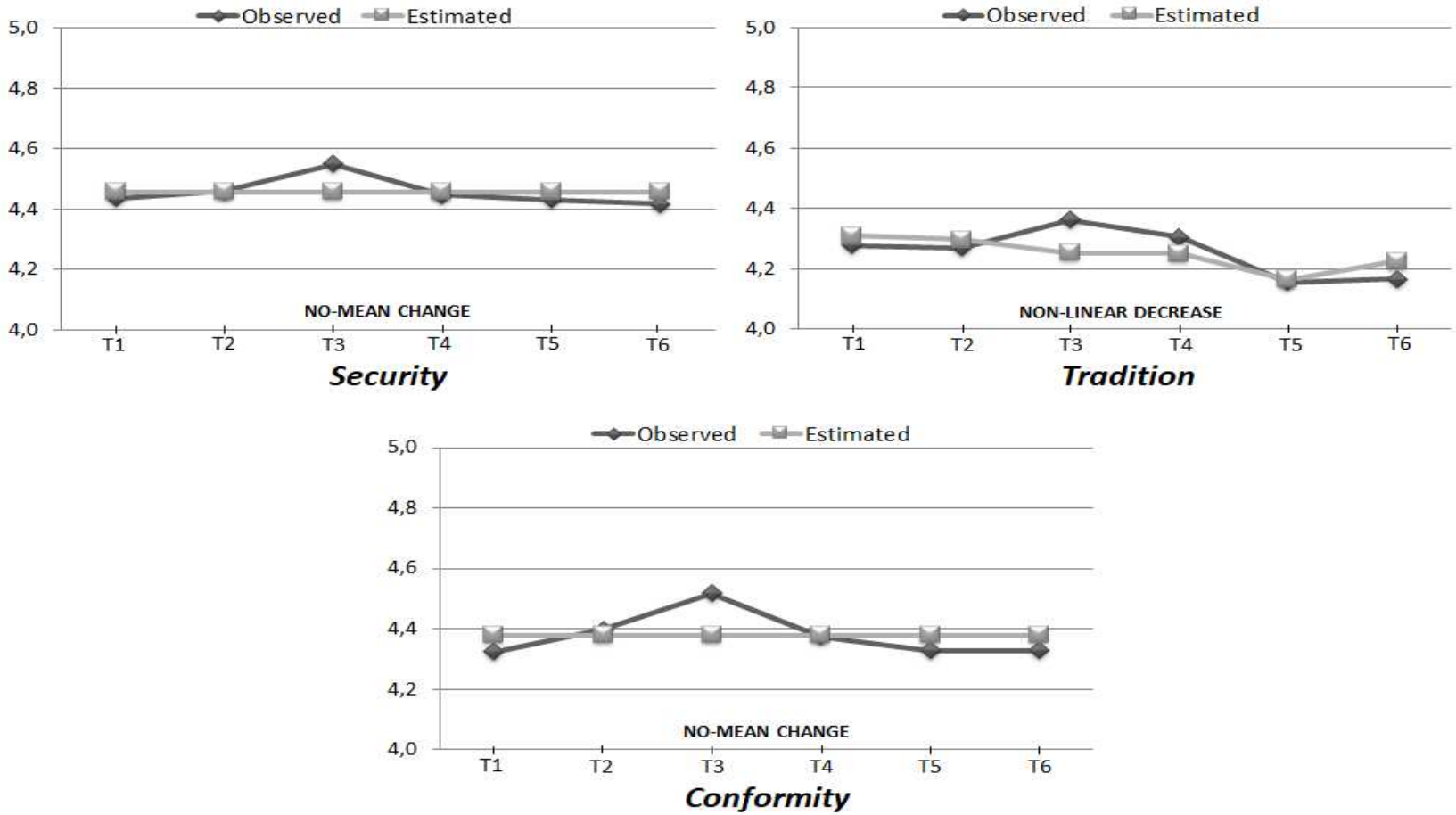


Figure 1, panel A. Observed means and estimated growth trajectories for conservation values.

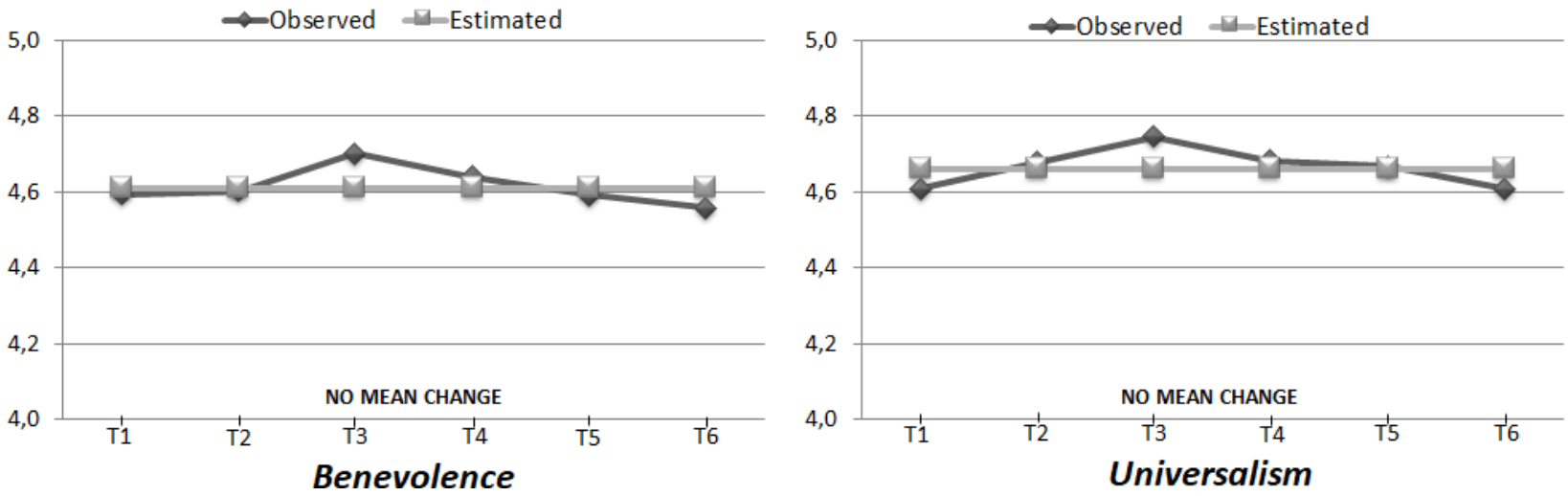


Figure 1, panel B. Observed means and estimated growth trajectories for self-transcendence values.

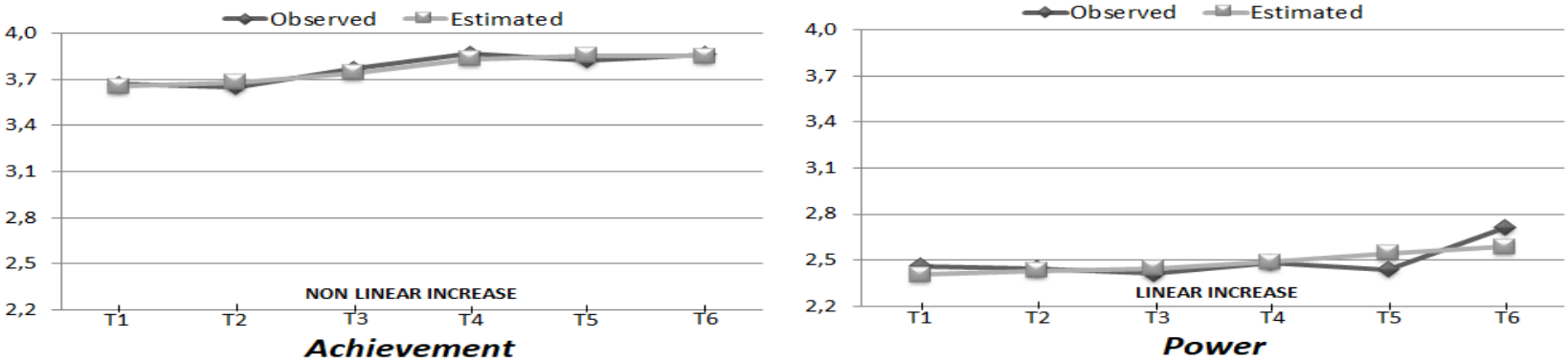


Figure 1, panel C. Observed means and estimated growth trajectories for self-enhancement values.

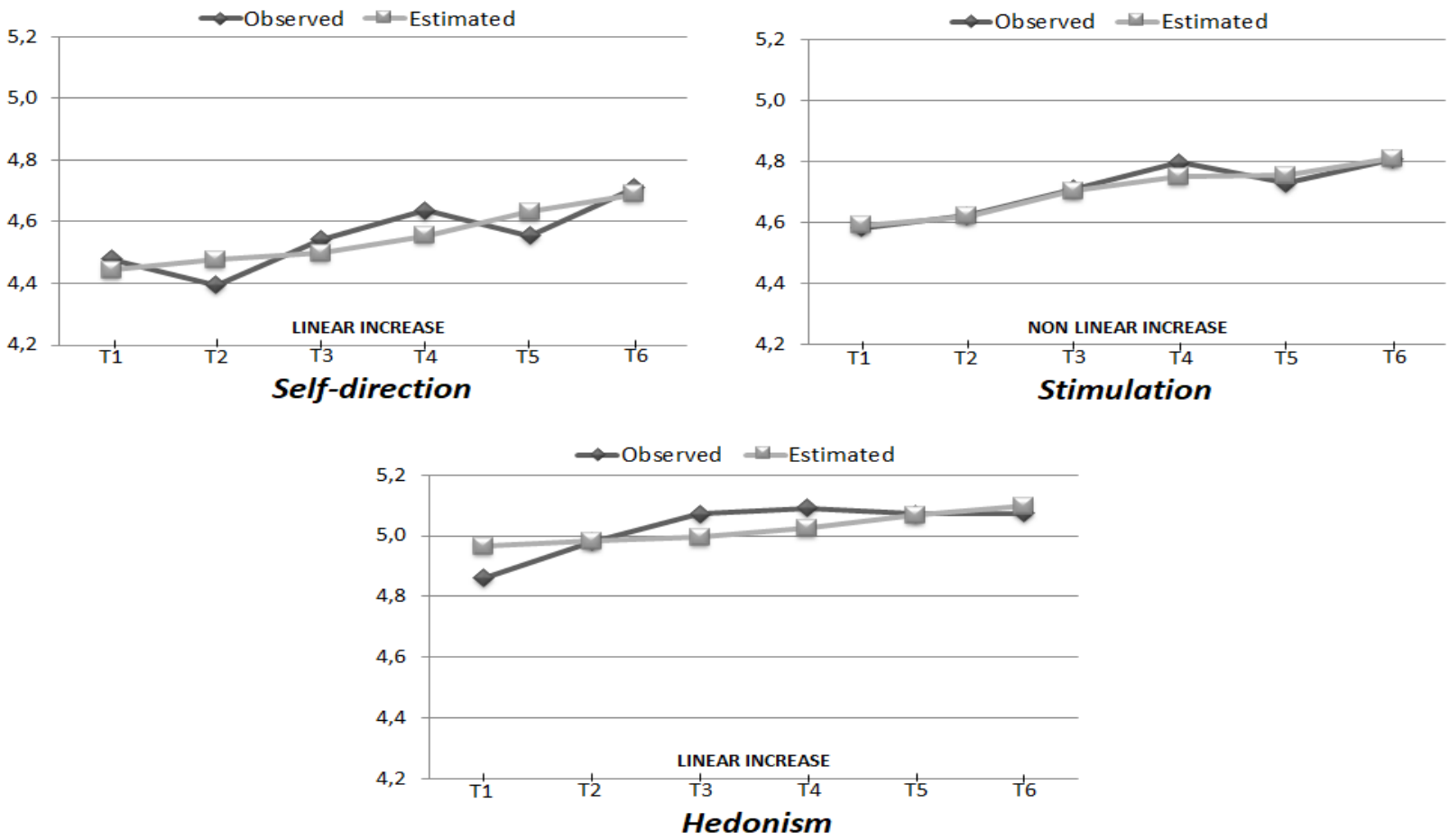


Figure 1, panel D. Observed means and estimated growth trajectories for openness to change values.

Table 1. Sample size, timing of data collection, and gender composition for each wave of data.

	T1	*T2*	*T3*	*T4*	*T5*	*T6*	*School year*	*Timing*	*% females*
T1	310						1	*December 2012*	45%
T2	282	304					1	*March 2013*	47%
T3	247	267	298				1	*May 2013*	44%
T4	177	191	205	241			2	*October 2013*	48%
T5	164	176	189	221	320		2	*May 2014*	46%
T6	150	159	168	196	272	298	3	*October 2014*	50%

Note. Values on the diagonal indicate the cross-sectional number of participants in each wave. Values below the diagonal indicate the number of individuals who participated in all waves included between the two measurement occasions on the column and the row (e.g., 247 individuals participated in the first three waves, and 267 individuals participated in both waves T2 and T3).

Table 2. Means and standard deviations of the importance of the ten values at each wave and value mean change from T1 to T6

	Time 1		Time 2		Time 3		Time 4		Time 5		Time 6		*T6-T1 change*	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	*p*	*Cohen's d*
Security	4.45	.95	4.47	.89	4.55	.94	4.55	.94	4.45	.93	4.46	.86	*.80*	*.01*
Conformity	4.33	.95	4.41	.90	4.52	.94	4.52	.94	4.40	.93	4.38	.88	*.56*	*.05*
Tradition	4.29	.91	4.29	.86	4.38	.91	4.38	.91	4.33	.81	4.21	.80	*.09*	*-.09*
Benevolence	4.59	.90	4.62	.90	4.72	.93	4.72	.93	4.69	.83	4.61	.81	*.80*	*.02*
Universalism	4.62	.88	4.68	.87	4.76	.90	4.76	.90	4.70	.86	4.65	.79	*.92*	*.04*
Self-direction	4.50	.87	4.40	.81	4.56	.84	4.56	.84	4.68	.74	4.73	.68	*<.00 1*	*.30*
Stimulation	4.59	1.00	4.63	.95	4.73	.96	4.73	.96	4.83	.87	4.80	.88	*<.00 1*	*.22*
Hedonism	4.86	.92	4.96	.90	5.08	.83	5.08	.83	5.12	.76	5.10	.71	*<.00 1*	*.29*
Achievement	3.66	1.07	3.62	1.13	3.73	1.15	3.73	1.15	3.85	1.18	3.84	1.03	*<.00 1*	*.17*
Power	2.47	1.16	2.43	1.19	2.40	1.19	2.40	1.19	2.48	1.17	2.65	1.08	*<.00 1*	*.16*

Table 3. Growth curve analysis: Goodness of fit of alternative models and chi-square difference tests

	Model 1. No-mean growth			Model 2. Linear growth			Model 3. Non-linear growth			1 vs. 2	2 vs. 3	1 vs. 3
	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA	$\Delta\chi^2$ (Δdf)	$\Delta\chi^2$ (Δdf)	$\Delta\chi^2$ (Δdf)
Security	**33.1 (17)**	**.98**	**.05**	31.3 (16)	.98	.05	29.1 (13)	.98	.06	1.8 (1)	2.2 (3)	4.0 (4)
Conformity	**40.5 (17)**	**.97**	**.06**	37.3 (16)	.97	.06	29.1 (13)	.98	.06	3.2 (1)	8.2 (3)	11.4 (4)
Tradition	60.9 (17)	.83	.08	50.2 (16)	.94	.07	**35.0 (13)**	**.96**	**.07**	10.7 (1)*	15.2 (3)*	25.9 (4)**
Benevolence	**33.4 (17)**	**.98**	**.05**	30.6 (16)	.98	.05	25.6 (13)	.98	.05	2.8 (1)	5.0 (3)	7.8 (4)
Universalism	**45.2 (17)**	**.97**	**.07**	43.4 (16)	.97	.07	40.7 (13)	.97	.08	1.8 (1)	2.7 (3)	4.5 (4)
Self-direction	75.1 (17)	.90	.10	**41.2 (16)**	**.96**	**.06**	36.9 (13)	.96	.07	33.9 (1)**	4.3 (3)	38.2 (4)**
Stimulation	40.4 (17)	.97	.06	27.5 (16)	.99	.04	**14.3 (13)**	**1.00**	**.02**	12.9 (1)**	13.2 (3)*	26.1 (4)**
Hedonism	35.7 (17)	.96	.05	**28.5 (16)**	**.97**	**.04**	24.3 (13)	.98	.05	7.2 (1)*	4.2 (3)	11.4 (4)
Achievement	53.3 (17)	.96	.07	42.2 (16)	.97	.06	**29.5 (13)**	**.98**	**.06**	11.1 (1)**	12.7 (3)*	23.8 (4)**
Power	64.5 (17)	.96	.08	**53.7 (16)**	**.97**	**.07**	43.6 (13)	.97	.08	10.8 (1)*	10.1 (3)	20.9 (4)**

Note. * p<.01; ** p<.001. Goodness of fit indices of the best-fitting models are in bold.

Table 4. Growth curve parameters for the best-fitting models.

	Security		Tradition		Conformity		Benevolence		Universalism	
	Estimates	*t*	Estimates	*t*	Estimates	*t*	Estimates	*t*	Estimates	*t*
Intercept										
Mean	4.46	116.38**	4.31	105.28**	4.38	113.96**	4.61	126.84**	4.66	125.83**
Variance	.538	10.01**	.40	8.05**	.48	9.10**	.42	8.97**	.49	10.26**
Slope										
Mean	.00[a]	-	-.08	-2.27*	.00[a]	-	.00[a]	-	.00[a]	-
Variance	.46	6.24**	.18	2.51*	.26	3.78**	.19	3.17*	.24	4.82**
Intercept-slope										
Correlation	-.34	-4.71**	-.28	-2.62**	-.20	-1.81	-.18	-1.49	-.27	-3.10*

(continued)

	Self-direction		Stimulation		Hedonism		Achievement		Power	
	Estimates	*t*	Estimates	*t*	Estimates	*t*	Estimates	*t*	Estimates	*t*
Intercept										
Mean	4.44	114.10**	4.59	94.81**	4.97	119.27**	3.65	65.77**	2.41	42.12**
Variance	.37	8.98**	.56	8.96**	.40	8.56**	.82	9.76**	.96	10.88**
Slope										
Mean	.25	5.99**	.22	4.20**	.13	2.69*	.20	3.48**	.18	3.35**
Variance	.17	3.19**	.36	3.96**	.34	4.72**	.41	3.85**	.31	4.04**
Intercept-slope										
Correlation	-.42	-4.47**	-.41	-4.95**	-.51	-7.17**	-.37	-4.57**	-.40	-4.65**

Notes. * $p<.01$; ** $p<.001$. The mean slope represents the average change from T1 to T6. The second, third and fourth slope factor loadings in the non-linear model were estimated to be .65, .67, and 1.70 for tradition, .52,.74, and .75 for stimulation, .44, .91, and 1.01 for achievement. [a] Fixed parameters.

Table 5. Rank-order stability of the ten values across pairs of waves

	T1-T2	T2-T3	T3-T4	T4-T5	T5-T6	T1-T6
Security	.74	.85	.78	.76	.90	.40
Conformity	.81	.82	.67	.73	.78	.59
Tradition	.78	.76	.75	.68	.85	.51

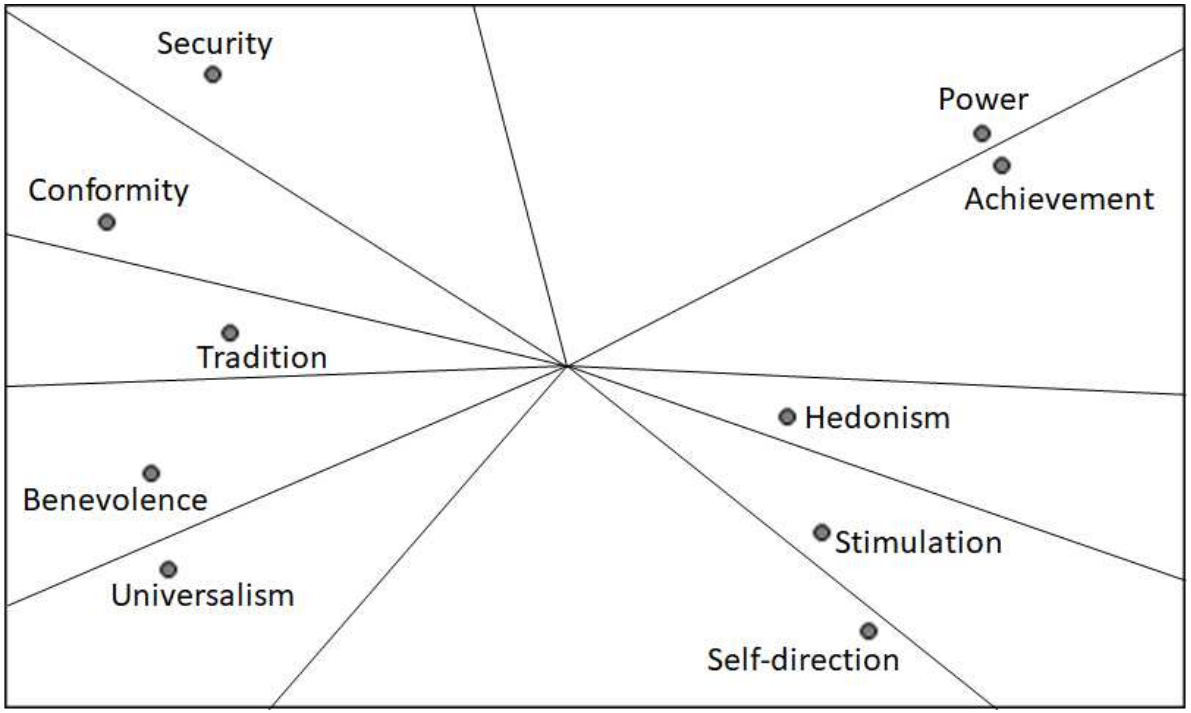
Benevolence	.68	.70	.73	.73	.76	.49
Universalism	.72	.79	.76	.79	.86	.63
Self-direction	.91	.69	.85	.67	.83	.73
Stimulation	.79	.70	.76	.80	.88	.70
Hedonism	.82	.58	.77	.59	.82	.39
Achievement	.79	.77	.76	.84	.75	.48
Power	.91	.79	.83	.94	.85	.77

Note. All correlations were significant at $p < .001$.

Table 6. Stability of within-person value hierarchies (profile stability) across pairs of waves

	Properties of the distribution								
	Central tendency			Dispersion		Percentiles		Shape	
	Mean	Median	SD	Min	Max	25th	75th	Skewness	Kurtosis
T1-T2	.83	.88	.16	.07	1.00	.76	.94	-1.78	4.12
T2-T3	.79	.85	.20	-.12	1.00	.71	.94	-1.52	2.39
T3-T4	.81	.87	.19	-.20	1.00	.76	.94	-2.24	6.79
T4-T5	.83	.88	.18	-.50	1.00	.77	.95	-2.79	12.41
T5-T6	.84	.90	.16	-.07	1.00	.78	.95	-2.18	6.54
T1-T6	.66	.72	.26	-.27	1.00	.50	.85	-1.03	.77

Appendix A. A two-dimensional MDS plot of the ten values at T1.



Note. The MDS has been performed by using the PROXSCAL procedure in SPSS (Borg & Groenen, 2005). We specified an appropriate starting configuration, by assigning a coordinate to each value that reflected its location on the motivational circle (see Bilsky, Janik & Schwartz, 2011).

Online Appendix B. Tests of longitudinal invariance

	Model 1			Model 2			Model 3		
	Configural invariance			Metric invariance			Scalar invariance		
Values	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA
Security [b]	462.77 (315)	.957	.035	491.81 (340)	.956	.034	526.29 (364)	.953	.034
Conformity [b]	234.48 (177)	.976	.029	258.71 (197)	.974	.029	283.26 (214)	.971	.029
Tradition [b]	259.04 (177)	.957	.035	291.91 (197)	.951	.036	319.42 (212)	.944	.036
Benevolence [b]	239.73 (177)	.976	.030	273.44 (197)	.971	.032	306.22 (216)	.966	.033
Universalism [b]	778.12 (489)	.938	.039	810.62 (519)	.938	.038	856.02 (547)	.934	.038
Self-direction [a,b]	266.18 (177)	.945	.036	298.83 (196)	.937	.037	327.23 (211)	.929	.038
Stimulation	93.98 (75)	.988	.026	111.91 (90)	.987	.025	140.76 (105)	.978	.030
Hedonism [b]	86.27 (75)	.992	.020	112.72 (90)	.983	.026	135.00 (103)	.976	.029
Achievement [b]	240.77 (177)	.980	.031	258.56 (197)	.980	.029	285.25 (216)	.978	.029
Power [b]	122.18 (75)	.983	.041	151.21 (90)	.978	.042	171.39 (102)	.975	.042

(continued)

	Model comparison			
	2 vs. 1		3 vs. 2	
Values	$\Delta\chi^2$ (df)	p	$\Delta\chi^2$ (df)	p
Security [b]	29.04 (25)	.26	34.48 (24)	.08
Conformity [b]	24.24 (20)	.23	24.55 (17)	.11
Tradition [b]	32.87 (20)	.03	27.52 (15)	.03
Benevolence [b]	33.71 (20)	.03	32.78 (19)	.03
Universalism [b]	32.50 (30)	.34	45.40 (28)	.02
Self-direction [a,b]	32.65 (19)	.03	28.40 (15)	.02
Stimulation	17.93 (15)	.03	28.85 (15)	.02
Hedonism [b]	26.46 (15)	.03	22.28 (13)	.05
Achievement [b]	17.79 (20)	.60	26.69 (19)	.11
Power [b]	29.03 (15)	.02	20.18 (12)	.06

Note. [a] metric invariance was partial: 1 loading at T5 was not invariant for self-direction; [b] scalar invariance was partial: 1 intercept at T3 was not invariant for security; 1 intercept at T3 and 2 at T6 were not invariant for conformity; 1 intercept at T2, 2 at T5, and 2 at T6 were not invariant for tradition; 1 intercept at T4 was not invariant for benevolence; 2 intercepts at T6 were not invariant for universalism; 2 intercepts at T2 and 2 at T6 were not invariant for self-direction; 1 intercept at T1 and 1 at T3 were not invariant for hedonism; 1 intercept at T1 was not invariant for achievement; 1 intercept at T1, 1 at T5, and 1 at T6 were not invariant for power.

Online Appendix C. Tests of measurement invariance across gender

	Model 1			Model 2			Model 3		
	Configural			Metric			Scalar		
Values	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA	χ^2 (df)	CFI	RMSEA
Security	19.22 (10)	.961	.077	20.81 (14)	.971	.056	31.96 (18)	.941	.071
Conformity [b]	4.53 (4)	.997	.029	9.51 (7)	.985	.048	10.02 (9)	.994	. 027
Tradition [a]	6.47 (4)	.972	.063	10.50 (6)	.949	.070	15.57 (8)	.915	.078
Benevolence	14.68 (4)	.946	.131	17.67 (7)	.946	.099	18.22 (10)	.958	.073
Universalism	38.73 (18)	.944	.086	39.82 (23)	.954	.069	47.73 (28)	.947	.067
Self-direction [b]	5.75 (4)	.980	.053	11.93 (7)	.945	.067	12.56 (9)	.960	.050
Stimulation [b]	-	-	-	1.28 (2)	1.00	.000	1.29 (3)	1.00	.000
Hedonism	-	-	-	4.97 (2)	.972	.098	6.53 (4)	.976	.064
Achievement	2.07 (4)	1.00	.000	8.83 (7)	.988	.041	14.44 (10)	.970	.054
Power [a]	-	-	-	.27 (1)	1.00	.000	1.82 (2)	1.00	.000

(continued)

	Model comparison			
	2 vs. 1		3 vs. 2	
Values	$\Delta\chi^2$ (df)	p	$\Delta\chi^2$ (df)	P
Security	1.59 (4)	.81	11.15 (4)	.02
Conformity [b]	4.98 (3)	.17	.51 (2)	.77
Tradition [a]	4.02 (2)	.13	5.07 (2)	.08
Benevolence	2.99 (3)	.39	.55 (3)	.91
Universalism	1.09 (5)	.95	7.91 (5)	.16
Self-direction [b]	6.18 (3)	.10	.63 (2)	.73
Stimulation [b]	1.28 (2)	.53	.01 (1)	.92
Hedonism	4.97 (2)	.08	1.56 (2)	.46
Achievement	6.76 (3)	.08	5.61 (3)	.13
Power [a]	.27 (1)	.60	1.55 (1)	.21

Note. The configural model for stimulation, hedonism and power is just-identified (zero degrees of freedom). The fit of these models cannot be evaluated. [a] Metric invariance was partial: 1 loading was not invariant across gender groups for tradition and power; [b] scalar invariance was partial: 1 intercept was not invariant across gender groups for conformity, self-direction, and stimulation.